

Assessment Of Thyroid Stimulating Hormone, Triiodothyronine, Luteinizing Hormone And Follicle-Stimulating Hormone Levels in Polycystic Ovary Syndrome

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ABSTRACT

Bachground: Polycystic ovarian syndrome (PCOS) is the most prevalent endocrinopathy and reproductive condition with hyperandrogenism that affects young women of reproductive age., It is a disorder with many distinct faces that affects millions of women worldwide, and it causes them considerable emotional and physical suffering. The present study is designed to estimate the TSH, T3, LH, and FSH levels in women with polycystic ovarian syndrome (PCOS). The blood samples were collected from 60 females, 30 control, and 30 patients. A device named VIDAS was used to measure TSH, T3 LH, and FSH. The present results indicated that levels of TSH, LH, and FSH were elevated ($P < 0.05$) significantly in the patient's group, while serum levels of Triiodothyronine decreased in the PCOS females group. According to the results of the current study, PCOS patients had hypothyroidism, which was demonstrated by elevated TSH, LH, and FSH levels.

Keywords: Polycystic ovary syndrome, Thyroid hormones (TSH and T3), Luteinizing hormone (LH), Follicle stimulating hormone (FSH).

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INTRODUCTION

Polycystic ovarian syndrome (PCOS) is one of the most prevalent endocrinopathies that affects females during their early reproductive years. Stein and Leventhal originally described PCOS in 1935. The diagnosis is based on three criteria created in 1990 by the National Institutes of Health (NIH), 2003 by the Rotterdam Criteria (ROT), and 2006 by the Androgen Excessive and PCOS Organization [1]. The most common endocrinological disease affecting women, polycystic ovarian

syndrome (PCOS), is the main factor contributing to irregular menstruation cycles during the reproductive years. It is defined by the presence of polycystic ovaries on ultrasonography and the clinical and biochemical signs of hyperandrogenism [2].

It is distinguished by a wide variety of signs that can appear alone or in various combinations with varying degrees of intensity. First, they are polycystic ovary/ovaries on gynecological ultrasound, ovarian dysfunction,

which can result in irregular or absent menstruation, hyperandrogenism, and/or hyperandrogenemia [3].

PCOS results from an unhealthy combination of environmental, genetic, and behavioral factors. Ovarian enlargement is one of the most common clinical symptoms of PCOS, and theca cells secrete higher levels of androgens than normal. Enzyme activity in the steroid synthesis pathway increases, which leads to an increase in androgenic secretion [4].

Infertility, hirsutism, weight increase, central obesity, and acanthosis nigricans are some of the clinical characteristics of PCOS [5–6]. It is the most prevalent endocrine condition in women of reproductive age. PCOS is characterized by irregular menstrual cycles and endocrine changes that lead to anovulation, infertility, and hyperandrogenism. Insulin resistance (IR) and hyperandrogenism are the two endocrine abnormalities PCOS patients experience most frequently. According to the Rotterdam criteria, PCOS affects 8 to 12% of women of reproductive age, but it has lately increased to 18% [7-8].

The most prevalent endocrine condition in the world is thyroid disorders. PCOS and hypothyroidism have fundamentally different etiopathogenesis. However, they both contribute to irregular menstruation and infertility [9,10].

Many women with this condition may also have thyroid problems, according to the findings of Shirsath et al. (2015). Hypothyroidism is associated with a rise in free testosterone and a decrease in sex hormone-binding globulin. Free testosterone is one of the factors that contribute to PCOS symptoms [11].

Thyroid hormones are necessary for maintaining both reproductive and metabolic health. Thyroid and TSH receptors are highly expressed during implantation in the fetomaternal unit, ovary, and uterus. [12]. Thyroid disorders are frequently observed in PCOS patients, especially hypothyroidism, which is

characterized by raised thyrotropin-releasing hormone (TRH), changed (FSH)/ (LH) ratios, and increased dehydroepiandrosterone (DHEAS) levels. FSH receptors are stimulated by increased thyroid-stimulating hormone (TSH) [13].

Increased risk of infertility, spontaneous miscarriage, preterm birth, and metabolic dysfunctions are related to thyroid hormone abnormalities or thyroid autoimmune disease, frequently seen in PCOS [14,15].

Changes in ovulation and menstruation are mostly responsible for the main consequences of abnormal thyroid levels. Changes in the levels of androgens, estrogen, follicle-stimulating hormone (FSH), and sex hormone-binding globulin (SHBG) may prevent ovulation. The body changes the hypothalamus gland's thyroid-releasing hormone (TRH) production. Ovulation and menstruation will vary due to the changes in TRH's effect on the hypothalamus, pituitary, and ovary feedback loop.[16]

To maintain proper ovarian function and egg maturation, the hormones produced by your thyroid combine with your reproductive hormones, progesterone, and estrogen (Krassas et al., 2010) [17]. Hormonal changes in the thyroid cause cystic ovarian alterations and an increase in ovarian bulk [18].

METHODS

The samples for the study were collected from patients who visited Al_Zahraa and Al-sader Hospital in the Najaf province. Samples were obtained during the period from January to June/2023. The study included a total of 60 females with the age group of (18-45) years. In this study, all of the women were nonsmokers.

The current study conducted a case study of 60 women, with 30 having PCOS and 30 being otherwise healthy. According to the Rotterdam criteria, PCOS can be diagnosed when a patient has two of the three symptoms listed below: an irregular cycle of menstruation, like

amenorrhea, hirsutism, or acne, and an ovary with a volume larger than 10 cm³ or 12 or more follicles with a diameter of 2 to 9 mm.

All females who had periods during the second and third day of the cycle had blood samples taken. Approximately 4 ml of blood was drawn into a gel tube to prepare the serum, which was utilized in the hormonal test. The serum was separated and centrifuged at 3000 Xg for 5–10 minutes before refrigeration at -20 until analysis.

Venous blood samples were used to perform laboratory blood testing, which included the following measures: TSH using VIDAS® TST Kit (BioMerieux (France)), T3 using VIDAS®T3 kit (BioMerieux (France)), LH using VIDAS® LH kit BioMerieux (France)), and FSH using VIDAS® FSH kit BioMerieux

(France). The instrument used in tests is VIDAS.

RESULTS

IBM SPSS statistic version 26 was used to perform all statistical analyses. The data were shown as the mean ± SD between the patient and control. The present research measures the level of the TSH and T3 hormones and the levels of the FSH and LH. The P-value of <0.05 was considered statistically significant.

A- Thyroid-stimulating hormone

According to the analysis of one-way ANOVA between the groups, as shown in (Table 1), there are significant differences (p=0. 004) between control and patients. The serum TSH levels were statistically significantly higher in the PCOS group than in the control group. Table (1) shows mean differences in TSH.

Table 1: Thyroid stimulating hormone level.

Variable	Study Group	NO.	Mean± Std. Deviation	P-value
TSH	Control	30	3.25 ± 1.88	0.004*
	Patient	30	11.78 ± 15.47	

*mean, significant different,p-value

B-Triiodothyronine

As in table (2), significant differences (p<0.001) between (mean± SD) of T3 levels (1.77 ± 0.54), (0.87± 0.453) of the control and patient, respectively. The serum T3 levels were statistically significantly lower in the PCOS group than control group.

Table 2: Triiodothyronine hormone level

Variable	Study Group	NO.	Mean ± Std. Deviation	P-value
T3	Control	30	1.77 ± 0.54	< 0.001*
	Patient	30	0.87± 0.453	

*mean, significant different,p-value

C- Luteinizing hormone

One-way ANOVA analysis between the groups, as displayed in (Table 3) revealed significant differences(p<0.001) between the patient and control groups.

Table 3: Luteinizing hormone level

Variable	Study Group	No.	Mean ±SD	P-value
LH (mIU/ml)	Control	30	4.96±2.99	< 0.001*
	Patient	30	13.47±5.75	

*mean, significant different,p-value

D- Follicle-stimulating hormone.

The groups, as displayed in (Table 4) revealed a significant difference (P<0.001) between means of FSH levels (6.32±2.55), (17.09±7.66) of control and patients.

Table (4) Follicle-stimulating hormone level

Variable	Study Group	No.	Mean±SD	P-value
FSH (mIU/ml)	Control	30	6.32±2.55	< 0.001*
	Patient	30	17.09±7.66	

*mean, significant different,p-value

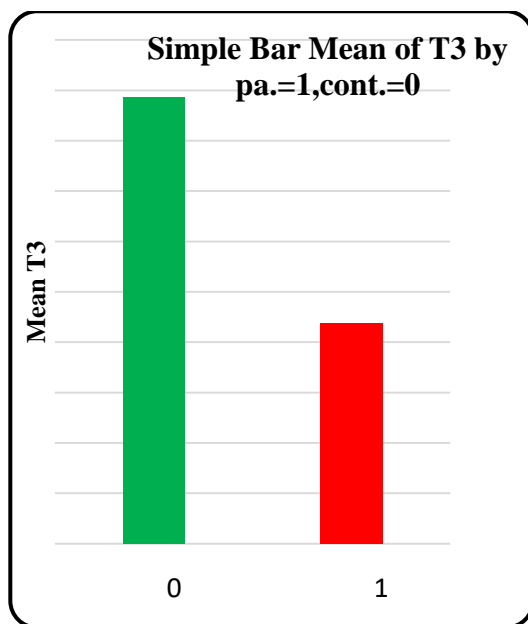


Fig.1. The evaluation of serum TSH levels in patients and control.

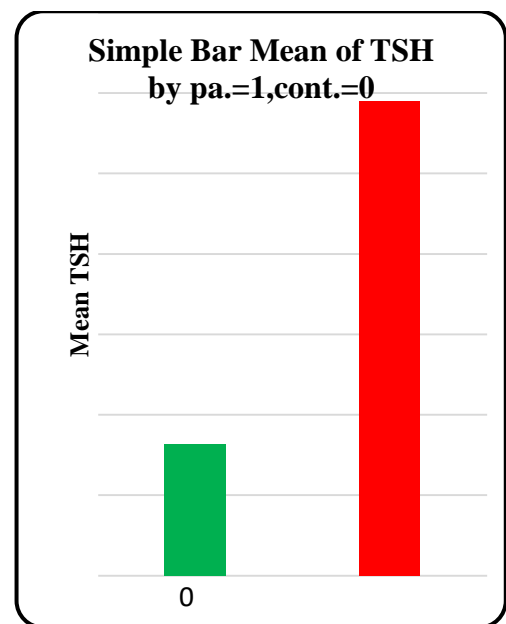


Fig.2. The evaluation of T3 levels patients and control.

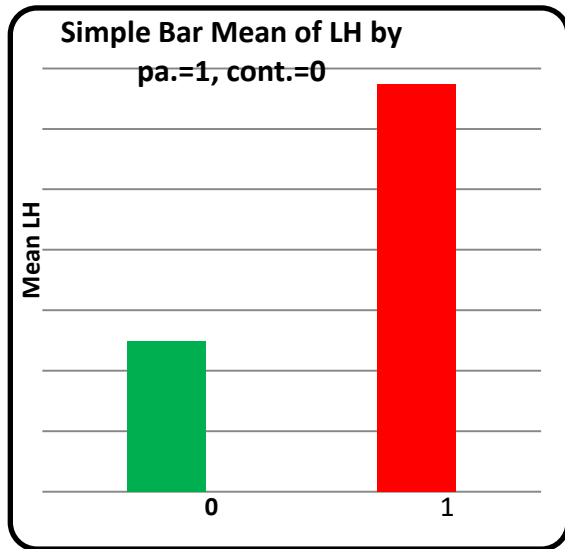


Fig.3 Evaluation of LH levels in control group and PCOS patients.

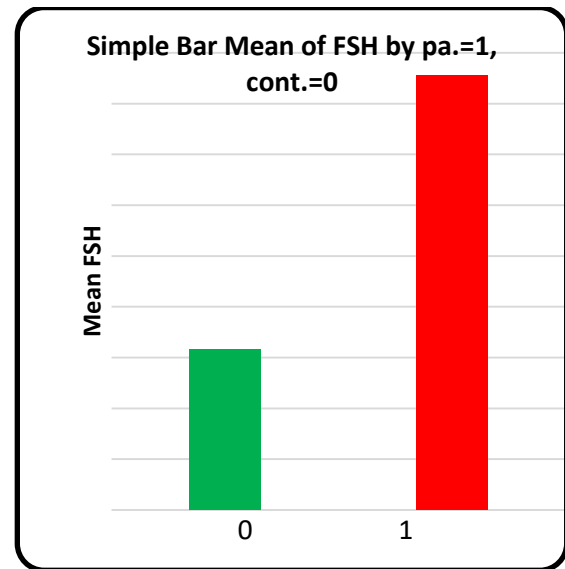


Fig.4 The evaluation of serum FSH levels in the control group and PCOS patients.

DISCUSSION

The human female reproductive system is affected by thyroid hormones in various ways. According to a new study, women with polycystic ovarian syndrome are more likely to experience thyroid problems. The incidence of goiter and subclinical hypothyroidism was significantly higher in the PCOS patients than in the normal groups in a study by Sinha et al. [19], which examined 80 PCOS patients and 80 controls. This study evaluated thyroid function by detecting the levels of the hormones TSH and T3 in the serum. In the current study, the serum TSH level was statistically significantly higher in the PCOS group than in the control group. The results of this study were supported by Cai et al. (2019), who also discovered that TSH levels are significantly higher [23]. TSH levels increase in PCOS patients due to underactive thyroid function, a common cause of infertility. When the thyroid is underactive, the hypothalamus and pituitary gland attempt to return things to normal by increasing the body's levels of the thyroid-stimulating hormone (TSH) and thyroid-releasing hormone (TRH). The hypothalamus's production of TRH stimulates the pituitary to secrete TSH (Dileep

2012) [25], Hence, It is common to assume that when the TSH value is high, the probability of getting HA, OD, and PCOM is also high. This suggests that the relationship between androgen and thyroid hormones which is thought to have a significant causal role—played a part in developing these conditions. LH and FSH production and secretion, which are frequently elevated in PCOS, are regulated by GnRH, as was previously recognized; it is thought that this GnRH may have regulated thyroid hormones at the pituitary gland. [20]. Thyroid hormones control the synthesis of androgens and their signaling through the direct and indirect control of the production and function of associated steroidogenic enzymes [21,22]. The result confirms that PCOS patients had a lower level of serum T3 concentration than the control group. The T3 result in the current study agreed with the findings of earlier studies by M Shareefa et al. (2020) [24], indicating a lower T3 level in females with PCOS. According to Fatma et al. (2016), there was not a significant difference between the patient group's serum T3 levels and those of the control group [26]. However, there is sufficient data to determine that people

with high BMI have higher TSH. Once again, nuclear pathophysiological pathways support the interesting relationship between thyroid functioning and obesity [27,28]. Obesity is linked to a changed environment with increased pro-inflammatory markers and insulin resistance. This resulted in decreased deiodinase-2 activity at the pituitary level through an unknown mechanism, which caused a relative T3 deficiency and raised TSH levels [28]. In Table 3, it is shown that there are significant differences ($p < 0.001$) between the levels of LH in the patients and the controls, which is supported by Fatma (2020). [26]. According to the results of the current study, the increase in LH levels in PCOS patients may be caused by the GnRH pulse generator's decreased sensitivity to feedback inhibition by ovarian steroids, which causes a rapid increase in GnRH pulse frequency and distribution in gonadotropin secretion that favors the secretion of LH over FSH [29].

The FSH result in the current study was consistent with the findings of previous research by Ibrahim and Abdelsalam (2015) [30], who reported that the FSH level was insignificantly increased in PCOS females in their study.

Suresh et al. (2015) [31] showed decreased FSH levels in females with PCOS. The level of FSH did not significantly change, according to Cascella et al. (2008) [32].

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Another study [33] reported reports of increased FSH and LH levels in PCOS women. The development of a follicle cohort is enabled by increasing pituitary FSH production throughout the early follicular phase. Relative intrinsic suppression of FSH action contributes to anovulatory in PCOS. FSH supplementation or the promotion of endogenous FSH synthesis with clomiphene citrate injection can increase the quantity of FSH and, hence, reverse the follicular halt. Inhibin A and B specifically inhibit pituitary FSH production [33].

CONCLUSION

The following conclusions of the current research are arrived at:

- 1- In conclusion, our study demonstrated that PCOS is common and that TSH values are increased in PCOS patients than in the control group. This finding believed the possibility that PCOS is an immunological illness and that it is closely related to hypothyroidism.
- 2- It increased LH levels that are linked to the development of PCOS.
- 3- The high levels of LH, FSH, and TSH are thought to be important contributors to the development of PCOS.

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